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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/829,546	04/22/2004	Robert Malcolm Setbacken	8371/13	7292

757 7590 11/21/2006

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EXAMINER	
MONBLEAU, DAVIENNE N	

ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 11/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/829,546	SETBACKEN ET AL.	
	Examiner	Art Unit	
	Davienne Monbleau	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 October 2006*.

2a)☐ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14 and 27-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14 and 27-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 10/12/06 with respect to claims 1-14 and 27-47 have been fully considered and are persuasive. The rejection of claims 1-14 and 27-47 has been withdrawn.

A new rejection on claims 1-14 and 27-47 follows.

Title

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Positional Encoder with Lead Frame Cavity Structure.

Abstract

The abstract is objected to because it does not provide a clear overview of the inventive concept, its environment, and its structure.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3-6, 11-14, 27, 28, 34-38, and 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura et al. (U.S. 6,803,560) in view of Leong et al. (U.S. 7,045,775).

Regarding claim 1, *Okumura* teaches (Figure 2) a positional encoder assembly comprising a light source (1) to generate an optical signal, an optical element support structure (8) housing a refractive optic (2) to direct the optical signal, a frame defining a cavity, a hollow within which the light source (1) is disposed, and a sensor (6) disposed within the cavity and adapted to generate an electrical signal in response to the optical signal. *Okumura* does not teach that said optical element support structure defines a protrusion and that the frame has a recess to receive the protrusion. *Leong (Figure 8)* teaches that the lens housing (66) is attached to the sensor housing (60) via a snap feature (74), which includes a protrusion and a recess. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a snap feature in *Okumura*, as taught by *Leong*, to fix the optical element support structure to the frame, provide alignment, as well as provide a release feature if needed for repair or adjustment. *Okumura* does not teach that the frame is a lead frame attached to a circuit board assembly such that the sensor is disposed at a predetermined elevation with respect to the circuit board assembly. *Leong (Figures 8 and 9)* teaches a sensor (82) comprising a lead frame (60) that is attached to a circuit board (column 4, lines 47-50) such that the sensor is disposed at a predetermined elevation with respect to the circuit board. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a lead frame attached to a circuit board

in *Okumura*, as taught by *Leong*, to facilitate electrical connection to other optoelectronic devices that are also connected to the circuit board.

Regarding claim 27, *Okumura (Figure 2)* teaches a positional encoder assembly comprising a light source (1) to generate an optical signal, a frame, the frame defining a first cavity and a hollow within which the light source (1) is disposed, and a sensor (6) disposed within a second cavity and adapted to generate an electrical signal in response to the optical signal. *Okumura* does not teach that the frame is a lead frame supported upon a circuit board assembly and the corresponding claimed structure of the lead frame. *Leong (Figures 8 and 9)* teach a sensor (82) with a lead frame (60) that is attached to a circuit board (column 4, lines 47-50) and a connector (68) positioned above the circuit board assembly and located externally to the lead frame. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a lead frame attached to a circuit board with external connectors in *Okumura*, as taught by *Leong*, to facilitate electrical connection to other optoelectronic devices that are also connected to the circuit board. *Okumura as modified by Leong (Leong, Figures 8 and 9)* does not teach that the sensor is supported on a lead frame contact. It is known in the art that the sensor must have a contact to be electrically connected to the lead frame. It would have been obvious to one of ordinary skill in the art at the time of the invention to support the sensor with a contact in *Okumura as modified by Leong* to connect the sensor to the lead frame while requiring minimum space. *Okumura as modified by Leong (Leong, column 4, lines 49-53)* teaches that the light source and sensor are attached to the lead frame by any suitable connection method, such as wire bonding, but does not teach the particular electrical connection means between the lead frame, circuit board, and sensor. It is known in the art to use connector pads and wire bonding to

create efficient electrical connections between optoelectronic devices. It would have been obvious to one of ordinary skill in the art at the time of the invention to use particular connection means in *Okumura as modified by Leong* to provide efficient electrical connections between the light source, sensor, lead frame, and circuit board. Determining the specific electrical connections is based upon the overall electronic circuit of the device. *Okumura as modified by Leong (Leong, Figures 8 and 9)* teaches a second cavity and the various electrical connections, but does not teach the height of the cavity with respect to the electrical connections. It is known in the art to have a specific structural arrangement of optoelectronic components based on space constraint, feasibility, and operational efficiency. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particular arrangement in *Okumura as modified by Leong*, to optimize the efficiency of the detector and provide a compact system.

Regarding claim 37, *Okumura (Figure 2)* teaches a positional encoder assembly comprising a light source (1) to generate an optical signal, a frame, the frame defining a first cavity within which the light source (1) is disposed, and a sensor (6) disposed within a second cavity and adapted to generate an electrical signal in response to the optical signal. *Okumura* does not teach that the frame is a lead frame supported upon a circuit board assembly and the corresponding claimed structure of the lead frame. *Leong (Figures 8 and 9)* teaches a sensor (82) with a lead frame (60) that is attached to a circuit board (column 4, lines 47-50) and a connector (68) positioned above the circuit board assembly and located externally to the lead frame. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a lead frame attached to a circuit board with external connectors in *Okumura*, as taught by *Leong*, to facilitate electrical connection to other optoelectronic devices that are also connected

to the circuit board. *Okumura as modified by Leong (Leong, Figures 8 and 9)* does not teach that the sensor is supported on a contact. It is known in the art that the sensor must have a contact to be electrically connected to the lead frame. It would have been obvious to one of ordinary skill in the art at the time of the invention to support the sensor with a contact in *Okumura as modified by Leong* to connect the sensor to the lead frame while requiring minimum space. *Okumura as modified by Leong (Leong, column 4, lines 49-53)* teaches that the light source and sensor are attached to the lead frame by any suitable connection method, such as wire bonding, but does not teach the particular electrical connection means between the lead frame, circuit board, and sensor. It is known in the art to use connector pads and wire bonding to create efficient electrical connections between optoelectronic devices. It would have been obvious to one of ordinary skill in the art at the time of the invention to use particular connection means in *Okumura as modified by Leong* to provide efficient electrical connections between the light source, sensor, lead frame, and circuit board. Determining the specific electrical connections is based upon the overall electronic circuit of the device. *Okumura as modified by Leong (Okumura, Figure 2)* teaches first and second cavities, but does not teach that the second cavity lies below the first cavity. It is known in the art to have a specific structural arrangement of optoelectronic components based on space constraint, feasibility, and operational efficiency. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particular arrangement of the cavities in *Okumura as modified by Leong*, to shield the detector from ambient light that could affect the accuracy of the detection and provide a more compact system.

Regarding claim 3, *Okumura as modified by Leong (Leong, Figure 9)* teaches a lead frame (60), but does not teach a contact disposed beneath the sensor. It is known in the art that

the sensor needs to be connected to the lead frame. It would have been obvious to one of ordinary skill in the art at the time of the invention to have a connector beneath the sensor in *Okumura as modified by Leong* to connect the sensor to the lead frame while requiring minimum space.

Regarding claim 4, *Okumura as modified by Leong (Leong, Figure 9)* teaches an external connector (64) protruding from the lead frame (60), the external connector connectable to the circuit board assembly.

Regarding claim 5, *Okumura as modified by Leong (Leong, column 4, lines 49-53)* teaches various connection methods for the die to the lead frame, including wire bonding and any other suitable connection method, but does not teach a connector pad for the external connector. It is known in the art to use connector pads to electrically connect various electrical components. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a connector pad in *Okumura as modified by Leong* to efficiently connect the external connector to other electrical component.

Regarding claim 6, *Okumura as modified by Leong (Leong, column 4, lines 49-53)* teaches a wire bond connectable between the die (62) and the lead frame (60), but does not teach that the sensor is connected to the external connector pad. It is known in the art to use connector pads to electrically connect various electrical components. It would have been obvious to one of ordinary skill in the art at the time of the invention to use wire bonding to connect the sensor to the external connector pad in *Okumura as modified by Leong* to electrically connect the sensor to the lead frame.

Regarding claims 11, 34, and 44, *Okumura as modified by Leong (Okumura, Figure 2)* a lens (2) but does not teach that it is prismatic. It is known in the art to use prismatic lenses in optical detectors. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particular type of lens (i.e. prismatic) in *Okumura as modified by Leong* based upon the desired optical characteristics of the device and the particular need for controlling the light.

Regarding claims 12-14, 35, and 45, *Okumura as modified by Leong (Leong, Figures 8 and 9)* teaches that the light source and sensor would have predetermined elevations but does not teach the specific value of the predetermined elevations. It is known in the art to place light emitters and sensors at particular heights based on their respective focusing characteristics and the desired light beam control. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particular structure arrangement to achieve desired relative predetermined heights in *Okumura as modified by Leong* based on the inherent optical characteristics of the light emitter and sensor and the desired light beam control relative to the target object and the sensor.

Regarding claims 28 and 38, *Okumura (Figure 2)* teaches an optical support structure housing a refractive optic (2) to direct the optical signal, but does not teach that said optical element support structure defines a protrusion and that the frame has a recess to receive the protrusion. *Leong (Figure 8)* teaches that the lens housing (66) is attached to the sensor housing (60) via a snap feature (74), which includes a protrusion and a recess. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a snap feature in

Okumura, as taught by *Leong*, to fix the optical element support structure to the frame, provide alignment, as well as provide a release feature if needed for repair or adjustment.

Regarding claims 36 and 46, *Okumura as modified by Leong (Leong, column 4, lines 49-53)* teaches that the light source and sensor are attached to the lead frame by any suitable connection method, such as wire bonding, but does not teach the particular electrical connection means between the lead frame, circuit board, and sensor. It is known in the art that the light source must be electrically connected to the lead frame via some kind of contact. It would have been obvious to one of ordinary skill in the art at the time of the invention to use particular connection means in *Okumura as modified by Leong* to provide efficient electrical connections between the light source, sensor, lead frame, and circuit board.

Claims 7-10, 30-33, 40-43, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura in view of Leong, as applied to claim 1 above, and in further view of Chin et al. (U.S. 2003/0193016).

Regarding claims 7, 30, 40, and 47, *Okumura as modified by Leong (Okumura, Figure 2)* teaches that the cavity is enclosed, but does not specifically teach an encapsulant. *Chin (Figure 8)* teaches an optically transparent encapsulant layer (410) disposed on the sensor (402). It would have been obvious to one of ordinary skill in the art at the time of the invention to use an encapsulant in *Okumura as modified by Leong*, as taught by *Chin*, to isolate the emitter/sensor from harmful external effects and stabilize its operating conditions.

Regarding claims 8, 31, and 41, *Okumura as modified by Leong and Chin (Chin, Figure 8)* teaches that the optically transparent encapsulant layer (410) encapsulates the sensor (402), but does not teach that it encapsulates the wire bonds and connector pads. It is known in the art

to encapsulate an entire device, including its electrical connections. It would have been obvious to one of ordinary skill in the art at the time of the invention to encapsulate the connector elements in *Okumura as modified by Leong and Chin* to isolate the emitter/sensor and connector elements from harmful external effects and stabilize its operating conditions.

Regarding claims 9, 32, and 42, *Okumura as modified by Leong and Chin (Chin, Figure 8)* teaches that the optically transparent encapsulant layer (410) is contained within the cavity of the lead frame (407).

Regarding claims 10, 33, and 43, *Okumura as modified by Leong (Okumura, Figure 2)* teaches a code scale (4), but does not teach that it is a disc or that it is disposed between the optical support structure (8) and the lead frame. *Chin (Figure 8)* a code disc disposed between an optical element (404) and the lead frame (407). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particular scale (i.e. code disc) in a particular location in *Okumura as modified by Leong*, as taught by *Chin*, to detect the angular rotation and position of an object. The position of the code scale relative to the other optical elements depends on the detection technique being used (i.e. reflective or transmissive).

Claims 2, 29, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura in view of Leong, as applied to claims 1, 27, and 37 above, respectively, and in further view of Franklin.

Regarding claims 2, 29, and 39, *Okumura as modified by Leong (Okumura, Figure 2)* teaches a sensor (6), but does not teach an OPTO-ASIC sensor. *Franklin (column 4, lines 61-64)* teaches a position encoder system comprising an OPTO-ASIC sensor on a circuit board. It would have been obvious to one of ordinary skill in the art at the time of the invention to use an

OPTO-ASIC sensor in *Okumura as modified by Leong*, as taught by *Franklin*, because they are easy to fabricate. Additionally, one of ordinary skill in the art would have been able to choose a particular sensor based on the detection needs and desired characteristics of the overall device.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Davienne Monbleau whose telephone number is 571-272-1945. The examiner can normally be reached on Monday through Friday 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Davienne Monbleau

DNM

Stephone B. Allen
Primary Examiner